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GENERAL NOTES.

The Committee on Publication has decided to conduct a new department in the *Publications* under the title given above. Many notes of a general character have appeared in the Notices from the Lick Observatory, but hereafter notices in that department will be confined to accounts or results of investigations being carried on in that institution. Members and friends of the Society are invited to aid the committee in carrying out the work of this new department. Communications of general interest will be gladly received and may be sent to SIDNEY D. TOWNLEY, 2023 Bancroft Way, Berkeley, California.

Dr. HENRY S. PRITCHETT, Superintendent of the United States Coast and Geodetic Survey, recently spent several weeks upon the Pacific Coast, looking after the affairs of the Department. A portion of his time was spent at Ukiah, California, superintending the erection of a latitude observatory to co-operate in the international campaign to determine the variation of the latitude. The Department proposes also to locate a magnetic observatory in California, which will co-operate with similar observatories to be established near Washington, D. C., and in the Hawaiian Islands, and with the magnetic observatories already established at Toronto, Havana, Mexico, and Manila. About ten years will be necessary to obtain a complete magnetic survey of the United States and its possessions. The Lick Observatory and the Students' Observatory, Berkeley, were among the places inspected by Dr. PRITCHETT for the location of the magnetic observatory, but we understand that his decision has not yet been announced.

The *Astronomical Journal*, No. 467, is given up to an article, by Professor S. J. BROWN, of the United States Naval Observatory, in which a new determination of the orbits of the satellites of *Mars* is made from a discussion of observations made with the 26-inch equatorial of the Naval Observatory and the 36-inch equatorial of the Lick Observatory, 1894–96.

Since we mentioned in the last number of the *Publications* a criticism of the second edition of CAMPBELL'S "Elements of Practical Astronomy," it is perhaps only just to state that *Science* for September 8th publishes a reply by Professor CAMPBELL. Of the reply we can say, as we did of the review, "The criticisms and suggestions there made are well worth the serious attention of every instructor of practical astronomy."

Miss LAURA SHEARER, a student of the University of the Pacific, College Park, has taken the "Definitive Orbit of Comet 1898 VI," as her thesis for the degree of B. S.

A new catalogue from the Zeiss Optical Works, Jena, gives two new combinations of lenses by which the secondary spectrum is almost entirely eliminated. One, the binary apochromatic lens, has a ratio of aperture to focal length of 1:17 to 1:20, while the other, the triple apochromatic lens, one flint and two crown glasses, has a ratio of 1 : 10 to 1 : 15.

The report of the Royal Observatory, Cape of Good Hope, for 1898, contains details of the mounting of the McLean telescope, a 24-inch photographic and 18-inch visual combination. The visual lens has proved entirely satisfactory, but some alterations are necessary in the photographic lens. The lenses were made by Sir HOWARD GRUBB. A new transit-circle is also being constructed for the observatory by TROUGHTON & SIMMS. It is to be mounted within a house of sheet steel.

A new determination of the photometric magnitudes of the stars of the *Pleiades* has been made by MUELLER & KEMPF, at the Potsdam Observatory. Their results are contained in Nos. 3587–88 of the *Astronomische Nachrichten.*

The last number of the *Vierteljahrsschrift der Astronomischen Gesellschaft* contains accounts of the work done, in 1898, at the various observatories and other astronomical institutions of Central Europe and also at the observatories at Cambridge (U. S. A.), Cordoba, and Williams Bay. We give below an outline of the chief lines of work carried out in the three institutions last named. We hope in the next number to be able to give a similar outline for the European institutions:—

CAMBRIDGE, OBSERVATORY OF HARVARD COLLEGE.—The researches of former years were carried on under the direction of Professor E. C. PICKERING. The work was almost entirely photometric and photographic in nature.

1. Photometric: The 15-inch and 6-inch equatorials were used in the observation of variable stars. The meridian photometer observations of all the stars, down to and including the 7.5 magnitude, were completed down to — 40° declination. The instrument has now been sent to the branch station in Arequipa, Peru, where the work will be continued to the south pole. Photometer observations have been commenced on certain regions where stars from 7.5 to 13 magnitude are observed.

2. Photographic: The various photographic telescopes were employed in work upon the *Algol* stars at minimum, *Jupiter's* satellites in eclipse, occultations, clusters, spectra of fainter stars, trails of stars near the pole to determine constants of aberration, nutation, and precession, etc., etc.

About 7,000 photographs are taken each year. These are measured and worked up by Mrs. FLEMING and twelve women assistants.

The work done in Cambridge is being extended to the southern skies at the station in Arequipa. The principal instrument there is the 24-inch Bruce telescope, with which the sky is being charted and the spectra of fainter stars observed. On one plate images of 400,000 stars appeared.

"A line of eight meteorological stations is maintained, extending from the sea-level to the top of El Misti, and on the other side into the valley of the Amazon. The elevations of these stations are: 100, 4,150, 8,060, 13,300, 15,600, 19,200, 11,000, and 3,000 feet respectively. Self-registering instruments record continuously the temperature, pressure, wind, etc."

"About fifty observers take part in the scientific work of the observatory, and its income of about $50,000 is derived from funds given by private individuals for this purpose. It receives no aid from the State, nor from the general funds of the University."

CORDOBA.—The work so admirably planned and carried out for fifteen years by Dr. GOULD has been greatly retarded during several years past by the financial difficulties in which the Argentine Republic is involved.

Dr. THOME gives the following programme of work for 1898:—

1. Extension of the southern *Durchmusterung* (visual).
2. A. G. Zones: Reobservation upon the meridian-circle of all the stars in the Cordoba *Durchmusterung* catalogues as bright as 9.2 magnitude; and, besides, such fainter ones as are given in our meridian catalogues.
3. Observations of comets, planets, and casual phenomena.
4. Determination of the geographical co-ordinates of the principal cities and towns of the Republic.
5. Computations corresponding to the above.
6. Computation of the ephemerides of the fifty-four stars in the Cordoba circumpolar list, for each year.
7. Preparation of the star-maps to accompany the *Durchmusterung* catalogues.
8. Time service: Signals every day at 11 A. M.
9. Various observations made at the solicitation of astronomers.
10. Revision and publication of the results.

In writing of the observation of meteors, Dr. THOME makes the following interesting statements concerning the weather: "The change which has taken place in our climate since the '80's is very remarkable. From being one of the finest in the world for astronomical pursuits, it has fallen to an average of little more than one clear night in two, and the extraordinary transparency of the atmosphere no longer exists. The annual average of clear nights in the interval from 1873 to 1881 was 269; from 1890 to 1898, it was 195; which, with the greater frequency of interruptions by clouds, implies a loss of nearly three months of observing yearly over the former period. In the year 1879, there was a period of ninety nights of uninterrupted meridian work. The change must be attributed, in part at least, to the creation of the large artificial lake in a valley of the mountains, about twelve miles distant, and to the irrigated zone now extending to the north and south of the city in our immediate vicinity."

WILLIAMS BAY — YERKES OBSERVATORY.— After giving a brief historical account of the observatory, Director HALE mentions briefly the scientific investigations which are being carried forward. The following extracts may be of interest:—

"*Double Stars.*— Professor BURNHAM has employed the 40-inch telescope on two nights of the week in the measurement of double stars, with the special purpose of preparing a catalogue of his own stars for publication. He has hitherto measured about one thousand pairs. No attempt has been made to search for new double stars, although a few have been discovered in the course of the work."

"*Star-Clusters.*— Professor BARNARD has verified with the 40-inch telescope a number of the variable stars discovered by Professor PICKERING in the cluster *Messier 5*. He has determined the period of several of these stars, and his results agree well with those of the Harvard observers. Two or three variables not marked on the Harvard photographs have been noticed in the observations. Professor BARNARD is also engaged in triangulating several star-clusters, and has measured the relative positions of 115 stars in *Messier 5*, 30 in *Messier 3*, and 50 in *Messier 13*. The latter positions agree well with those obtained photographically by Professor SCHEINER. In some instances, three stars have been seen and measured where but one is shown on SCHEINER'S photographs. It has been found that the stars designated by SCHEINER with the numbers 393, 401, 749, and particularly 382 (his normal star), are much fainter visually than photographically."

"*Planets and Satellites.*—During the summer of 1898 Professor BARNARD made a series of forty-three measures of the diameter of *Venus* and eleven of the diameter of *Mercury* with the 40-inch telescope. No traces of the linear markings recently described by several observers could be detected, although the atmospheric conditions were frequently excellent and the vague markings seen by Professor BARNARD at Mt. Hamilton were visible."

"*Spectra of Stars of Secchi's Fourth Type.*— A photographic study of stars of SECCHI'S fourth type was undertaken by the writer [Professor HALE], in conjunction with Mr. ELLERMAN, in January, 1898. A large number of photographs have been secured of stars ranging in magnitude from 5.4 to 8.2. The earlier work was done with a single prism, but later it was found possible to use a dispersion of three prisms, even with the faintest stars. Several hundred lines have been measured in these spectra and the radial velocity has been sufficiently well determined to permit the wave-lengths to be corrected for motion. The photographs, which have been made here with the 40-inch telescope and by Professors KEELER, CAMPBELL, and DURIER, have led to the conclusion that the spectra of these stars contain bright lines. Photographs recently obtained, which are much superior to the earlier ones, show an almost perfect agreement of the spectrum of *132 Schjellerup* with that of the third type star μ *Geminorum* in certain regions in the blue and green. There can thus be no doubt of an intimate connection between stars of the third and fourth types. It has also been found possible to arrange the spectra of eleven stars of the fourth type in a series having at one end *280 Schjellerup* and at the other end *155 b Schjellerup*. In *280 Schjellerup* the characteristic dark bands (attributed to carbon) are inconspicuous, while in *155 b Schjellerup* they are strongly developed." A detailed account of this work is given in the August number of the *Astrophysical Journal*. It is the first of a proposed series on the same subject.

Other important investigations are being carried out, the natures of which are indicated in the following headings given by Professor HALE: Stellar Photography; *Leonid* meteors; Spectrum of the Chromosphere; Solar Photography; Determination of Stellar Velocities in the Line of Sight; Miscellaneous Stellar Spectroscopic Work; Spectra of *Jupiter* and *Saturn*; Color Curve of the 40-inch Objective; Theory of Optical Instruments; Stellar Heat Radiation; Variable Stars; Experiments in Lunar Photography with the 40-inch Telescope; and Spectrum of the Iron Spark in Air.

At the annual meeting of the American Association for the advancement of science, held in Columbus, Ohio, August 21st to 26th, Professor ASAPH HALL, Jr., Director of the Observatory of the University of Michigan, was elected vice-president of Section A, Mathematics and Astronomy. Three papers of astronomical interest were read before the meeting,—one by ASAPH HALL, Jr., one by R. W. McFARLAND, and a third by H. C. LORD. An abstract of Professor LORD's paper—"Some Points in Spectroscope Design"—written by himself, is given below:—

This paper supplemented one published in the *Astrophysical Journal* for April, with twelve photographs of the solar spectrum, and discussed them by curves drawn in accordance with the method above given. The photographs were taken with cameras whose focal lengths were in the ratio 1:3:4, and with an optical dispersive power of one light flint prism, one dense flint prism, two dense flint prisms, and the third order of a 14,000-line grating, combining each camera with each prism or grating in turn. These photographs showed that of the three factors, namely, optical contrasting power, optical resolving power, and photographic resolving power, that optical contrasting power was by far the most important. That full photographic resolution would be secured on rapid plates when the width of the diffraction pattern of a line at λ 4340, whose width was 0.168 Angstrom units, was in the neighborhood of $0^{mm}.08$ and when this width was as small as $0^{mm}.03$ full visual resolution could not be reached photographically. Attention was called to the fact that on account of the slit width being limited by practical considerations to about one thousandth of an inch, two spectroscopes could be designed which would give exactly the same optical and photographic resolving power and contrasting power, while the ratio of focal length to aperture would in the one case be 1:12 and in the other 1:24.

The Third Conference of Astronomers and Astrophysicists was held at the Yerkes Observatory, September 6th to 8th. Cloudy weather prevailed most of the time, so that those in attendance were able to see but little with the great telescope. The following is a list of the papers read before the meeting :—

A. S. FLINT: The Repsold Transit Micrometer of the Washburn Observatory and Slat-Screen Apparatus.

S. J. BROWN: The Position of the Axis of *Neptune* from Perturbations of its Satellite.

E. E. BARNARD: Notes on the Annular Nebula in *Lyra*, the Fifth Satellite of *Jupiter*, Triangulation of Star Clusters, and Measures of the Difference of Declination of the Stars *Atlas* and *Pleione*.

WILLIAM HARKNESS: On the Semi-Diameters of the Sun and Moon.

F. R. MOULTON: Problems in Modern Celestial Mechanics Treated by the Use of Power Series.

ORMOND STONE: On the Motion of *Hyperion*.

E. C. PICKERING: The Revised Harvard Photometry.

KURT LAVES: Determination of the Principal Term of Nutation from Observations of *Eros*.

W. W. CAMPBELL: Wave-Length of the Green Coronal Line.

ASAPH HALL, Jr.: Aberration Constant from Meridian Zenith Distances of *Polaris*.

J. E. KEELER: The Ring Nebula in *Lyra*.

GEORGE E. HALE: Notes on Carbon in the Chromosphere, the Connection between Stellar Spectra of the Third and Fourth Types, and Some New Forms of Spectroheliographs.

E. B. FROST: Notes on the Reduction of Stellar Spectra, Titanium as a Comparison Spectrum, and Corrections of Absolute Wave-Lengths due to the Earth's Motion.

FRANK SCHLESINGER: Suggestions for the Determination of Stellar Parallax by Means of Photography.

S. I. BAILEY: Note on the Relations between the Visual and Photographic Light Curves of Variable Stars of Short Period.

S. I. BAILEY: The Periods of the Variable Stars in the Cluster *Messier 5*.

H. S. DAVIS: A Statement of the Progress of the New Reduction of PIAZZI's Meridian-Circle Observations between 1792 and 1814.

W. W. CAMPBELL: The Spectroscopic Binaries *Capella* and *Polaris*.

F. L. CHASE: Refraction of Red Stars.

GEORGE C. COMSTOCK: Some Researches in Stellar Color.

KURT LAVES: Inner Potential Forces Applied to Celestial Mechanics.

F. R. MOULTON: Laplace's Ring Nebular Hypothesis.

G. W. HOUGH: On the Actinism or Photographic Power of the Moon in a Total Eclipse.

M. B. SNYDER: The Phonochronograph and its Advantages in certain Astronomical Observations.

One of the astronomers present has kindly furnished us with the following notes concerning the papers :—

Dr. LAVES, in his paper, showed that the next opposition of the planet *Eros* would present a very favorable opportunity for the determination of the principal term of the constant of nutation.

Professor KEELER'S paper on the Ring nebula in *Lyra* was accompanied by lantern-slides made from the negatives of this interesting object taken with the Crossley reflector. Professor BARNARD called attention to the fact that a star which he had found at the limit of visibility with the 40-inch telescope was shown on the Crossley plate of two hours' exposure, and the plate seemed to show yet fainter stars.

Professor CAMPBELL'S paper gave the results of his observations on *Capella* and *Polaris.* Both were found to be spectroscopic binaries. In the case of *Capella* the lines were doubled periodically, while in *Polaris* they were periodically displaced, showing motion about a dark body.

Professor BAILY'S paper gave a table of periods and magnitudes of the variable stars in the cluster *Messier 5.* The fainter variable stars in this cluster have all nearly the same period—about half a day. They have nearly the same magnitudes, and the range from maximum to minimum is about one magnitude. Professor BAILY thinks that they must all have had the same period at one time, and that perturbations have since changed them. There was found to be no relation between the distance of the star from the center of the cluster and its period. These variables range from 14^m to 15^m.

Some of the researches discussed by Professors HALE and BARNARD in their papers have already been mentioned in the extracts from the *Vierteljahrsschrift.* Professor HALE gave in addition an account of his observations by which carbon was discovered in the chromosphere. Professor BARNARD gave also an account of his observations with the 40-inch telescope, at different temperatures, to see if the curvature of the large object-glass changed. Observations were made over a range of 106° of temperature and a shortening of the focus was found in the cold weather. An account of these observations was published in No. 462 of the *Astronomical Journal.*

At the third conference of astronomers and astrophysicists held at the Yerkes Observatory in September, a permanent organization was affected under the name of "The Astronomical and Astrophysical Society of America." One of the charter members has kindly forwarded us a copy of the constitution of the society, the salient points of which are contained in the following extracts:—

"The purpose of this Society is the advancement of astronomy, astrophysics, and related branches of physics."

"Those persons whose names were signed on or before September 15, 1899, to the annexed statement of desire to form such an association shall constitute the charter members of this Society. Other persons may be elected to membership in the Society by the Council hereinafter provided."

"The officers of the Society shall consist of a president, two vice-presidents, a secretary, and a treasurer. . . . These officers together with four other members of the Society shall constitute a Council to which shall be intrusted the management of all affairs of the Society not otherwise provided for."

"The Council shall determine the time and place of each meeting of the Society, and shall provide for an annual meeting, at which officers shall be elected."

"The Council shall levy an annual assessment upon the members of the Society sufficient to provide the funds required by the Society for the ensuing year; provided that this assessment shall not exceed the sum of five dollars per member in any year."

The officers elected are as follows:—

President	SIMON NEWCOMB, Washington, D. C.
Vice-Presidents,	CHARLES A. YOUNG, Halsted Observatory. GEORGE E. HALE, Yerkes Observatory.
Secretary	GEORGE C. COMSTOCK, Washburn Observatory.
Treasurer	C. L. DOOLITTLE, Flower Observatory.

Other members of Council: E. C. PICKERING, Harvard College Observatory; JAMES E. KEELER, Lick Observatory; E. W. MORLEY, Adelbert College; ORMOND STONE, Leander McCormick Observatory.